GROUP PROJECT DESCRIPTION

TRACK #1: Heuristic and Markowitz Modern Portfolio Management Investment Strategies

Overview: The project consists of investigating the empirical properties of financial market returns using US stock market data and empirically testing the performance of selected portfolio investment strategies.

TASKS:

1. Select a diversified portfolio of 11 S&P500 listed stocks, one per each of the 11 different sectors that comprise index (e.g., Health Care, Financials, Consumer Discretionary, Industrials), and download market data from 01-01-2010 to 31-12-2022.
2. For each stock, compute the daily, weekly, and monthly log-return using the adjusted closing price information.
3. Empirically investigate the following financial market returns stylized facts for the three data frequencies (daily, weekly, monthly data):
    - Absence of auto-correlation
    - The unconditional distribution of daily returns does not follow the normal distribution / Fat Tails
    - The return distribution is asymmetric or negatively skewed
    - Volatility Clustering
    - Leverage Effects
    - Conditional Non-Normality
4. Split the dataset into a training set (01-01-2010 to 31-12-2015) and a test set (01-01-2016 to 31-12-2022). Empirically investigate the performance of the following investment strategies in the test set (note: use training set to calibrate the models).
    A. Buy & Hold
    B. Equally weighted portfolio
    C. Quintile portfolio

D. Markowitz's mean-variance portfolio (MVP) with no short-selling
E. Global Minimum Variance Portfolio (GMVP) with no short selling
F. Estimate the Maximum Sharpe ratio portfolio (MSRP)
G. Inverse Volatility Portfolio (IVP)

5. Critically discuss the results considering alternative risk-adjusted performance metrics (e.g., returns, volatility, Sharpe ratio, Sterling ratio, drawdown).
6. **Extra points**: Use the same data set to investigate the performance of portfolio management strategies using alternative risk measures, e.g., downside risk, Value-at-Risk (VaR), Conditional VaR (CVaR) or expected shortfall (ES).

TRACK #2: Backtesting Risk-Based Portfolios

Overview: The project consists of empirically testing the performance of selected portfolio risk based investment strategies.

TASKS:

1. Download monthly market data for S&P500 listed stocks from 01-01-2010 to 31-12-2022.
2. Generate 100 random resamples of 20 S&P500 listed stocks and 3 consecutive data.
3. Empirically investigate the performance of the following traditional and risk-based portfolios.
   A. Global Minimum-Variance Portfolio with no short-selling
   B. Inverse Volatility Portfolio
   C. Risk parity portfolio
   D. Most diversified portfolio
   E. Maximum decorrelation portfolio
   F. Hierarchical Risk Parity Portfolio
   G. Markowitz's mean-variance portfolio (MVP) with no short-selling

4. Critically discuss the results considering alternative risk-adjusted performance metrics (e.g., returns, volatility, Sharpe ratio, Sterling ratio, drawdown).
5. **Extra points:** Use the same data set to investigate the performance of portfolio management strategies using alternative risk measures, e.g., downside risk, value-at-risk (VaR), Conditional VaR (CVaR) or expected shortfall (ES).

GROUP SIZE, PROJECT MILESTONES & REPORTS

The standard (and recommended) group size is 4. You are responsible for organizing your own groups. A single digital written report/essay with the outline and the answers to all problems above must be submitted by email to jbravo@novaims.unl.pt no later than October 27, 2023. Additionally, you are asked to send the Word/LaTeX, EXCEL, PDF, R Script or Python files.